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The Feasibility of Electronic Marketing for the Wholesale Meat Trade

United States Department of Agriculture
Agricultural Marketing Service
Economics, Statistics and Cooperatives Service
AMS-583
May 1979

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October 18, 1978

The Honorable Bob Bergland
Secretary
Department of Agriculture
Washington, D. C. 20250

Dear Mr. Secretary:

Enclosed please find a copy of a Report recently filed by this Committee entitled "Small Business Problems in the Marketing of Meat and Other Commodities (Part 1 - Meat Marketing)."

Please note that on page 33 of the Report, the U. S. Department of Agriculture is requested to "forthwith research and study the feasibility of a centralized market system for meats, and report to this subcommittee thereon by March 1, 1979."

Thanking you for your cooperation and with best wishes, I am

Sincerely,

Neal Smith

Neal Smith
Chairman

JMF/la
Enclosure

DEPARTMENT OF AGRICULTURE
OFFICE OF THE SECRETARY
WASHINGTON, D. C. 20250

April 9, 1979

LETTER OF TRANSMITTAL

Honorable Neal Smith
Chairman, Committee on Small Business
House of Representatives
Washington, D.C. 20515

Dear Mr. Chairman:

We are transmitting a Department of Agriculture study on "The Feasibility of Electronic Marketing for the Wholesale Meat Trade." This was undertaken as recommended in a report of your Committee entitled "Small Business Problems in the Marketing of Meat and Other Commodities (Part I - Meat Pricing)" dated October 13, 1978.

The study was conducted by staff members of the Agricultural Marketing Service and the Economics, Statistics and Cooperatives Service of this Department.

Sincerely,

Bob Bergland

BOB BERGLAND
Secretary

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May 1979

SUMMARY

In 1978, 38 billion pounds of meat were produced in the United States from livestock slaughter. Included in this were 24 billion pounds of beef, 13.2 billion pounds of pork, 600 million pounds of veal, and 300 million pounds of lamb and mutton. At 40,000 pounds per truckload (a little more than an average load) this would be equivalent to 950,000 truckloads a year, or 3,600 truckloads a day.

The market for meat is a national market. Almost three-fourths of the meat comes from meat packers in the Midwest and Great Plains States. From these areas surplus supplies move to Eastern and Southern States and to States on the Western Slope.

Problems in wholesale pricing have become matters of continuing concern and recurring contention as formula pricing has grown at the expense of negotiated transaction prices. In formula selling, the transaction price is based on a market quotation for a date in the future, usually on the day of shipment or the day before. This erodes the base for reporting negotiated transaction prices. Information tends to become so scattered, so fragmented, and so limited that it is difficult to say what happened in the market on a given day.

Technological advances in data processing and communications have made computerized electronic trading possible. Instead of contacting potential buyers one after another, a seller having an electronic exchange system at his disposal can now contact all potential buyers simultaneously.

In 1975, Congress mandated that the securities industry move toward a national market via computerized electronic trading. The Securities and Exchange Commission was directed to facilitate such a shift.

Two systems for selling securities have been developed. The Intermarket Trading System (ITS) connects six stock exchanges, including New York City. A trader on one floor who sees a more favorable potential trade on a distant floor can execute it. The Cincinnati NMS (National Market System) is an electronic nationwide stock exchange that completely circumvents traditional floor operations.

Cotton is now being sold electronically by TELCOT in Lubbock, Tex. Egg Clearinghouse, Inc. (ECI) sells truckload lots of gradable nest-run eggs in the wholesale egg trade.

Electronic trading maximizes competition in the marketplace. It puts each seller in simultaneous contact with all buyers in the market and each buyer in simultaneous contact with all sellers. With a large volume of trading, it can be a most efficient exchange device.

The more widely a given language with a commonly understood trading vocabulary can be used, the greater the potential for electronic trading. Sale by description is necessary for electronic trading between parties in different localities.

Meat is sold by description. It is a high value product. It is perishable product which must be moved into commerce within a few days after livestock are slaughtered. Meat moves great distances until it reaches localities where it is consumed. Thousands of transactions take place weekly. Wholesale meat as a commodity appears well suited for electronic trading. The technology is here.

THE FEASIBILITY OF ELECTRONIC MARKETING FOR THE WHOLESALE MEAT TRADE

by

Gerald Engelman, David L. Holder,
and Allen B. Paul[*]

The wholesale red meat trade handles a commodity valued at about $37.5 billion in 1979. Because sales of livestock often account for one-third or more of cash-farm receipts, wholesale meat represents the source of income for a most important sector of American agriculture.

MEAT WHOLESALING - HISTORICAL PERSPECTIVES

The growth and development of the wholesale meat trade in this country has often reflected a response to changes in technology. During the Colonial period wholesaling did not exist as an institution separate from retailing and slaughtering. Ninety percent of the population was rural and provided their own meat supplies. In towns and smaller cities, retail butchers bought livestock from nearby farmers, butchered them in their backyards, and sold meat to their customers the next day. In larger cities, such as Boston, New York and Philadelphia, retail butchers had their livestock slaughtered at municipal abattoirs.

The beginning of commercial cattle feeding in Ohio in 1805 marked the beginning of an epoch when slaughtering began to be separated from retailing. The cattle were driven over the Appalachian Mountains to Eastern seaboard cities and sold for slaughter. As livestock raising and feeding increased in the expanding "West", a new slaughtering industry developed in larger Eastern urban centers. Instead of buying live animals from farmers, retailers began to buy carcasses of beef and pork from livestock slaughterers. Later, as refrigeration became more common, retail butchers began to make regular selections in coolers from the available carcasses, usually during pre-daylight hours, for the oncoming day's retail sales.

With the continued westward expansion of the agricultural frontier and the growth of the industrial East, meat wholesaling was still conducted in this fashion as livestock were shipped by rail across the Appalachians from points as far away as Chicago.

---

[*] Gerald Engelman is Staff Economist, Agricultural Marketing Service, U.S. Department of Agriculture; David L. Holder and Allen B. Paul are economists in the Economics, Statistics,and Cooperatives Service, U.S. Department of Agriculture.

In 1870 a new technology of meat shipment in refrigerated cars made possible the slaughter of livestock nearer the farms where they were raised and fed, some distance away from large Eastern consuming centers. Retail butchers had a new supplier--the branch house--a distribution outlet for a distant slaughterer, usually hundreds of miles away. But wholesale trading was little changed. Retailers would personally inspect the supplies of carcasses, wholesale cuts, cured and sausage meats, for the demands of their trade and bargain with the wholesaler over price, face-to-face.

By World War I slaughter by retail establishments had dropped to about one-fourth of the cattle and less than one-tenth of the hogs. The wholesale meat trading process remained much the same. Selection was by personal inspection of the product and bargaining was still face-to-face. Local slaughterers and packer-owned branches were still important supply sources. However, a new institution had emerged--the independent meat wholesaler. These independent operators handled the output of smaller, independent Western slaughterers. The larger national packers (Swift, Armour, Morris, Wilson, Cudahy) still wholesaled primarily through their network of wholly-owned branch houses.

Also, by World War I, meat packing plants had begun to establish car route distribution. A railroad refrigerator car would be dispatched several times a week along a regular route, serving clients with less than carload shipments. During the decades of the 1920's and 1930's, these were gradually replaced by truck routes. Orders would be taken by advance salesmen and relayed back to the distribution center.

Another institution that became important after 1900 were nonslaughtering meat processors. These firms would buy carcasses and wholesale cuts from slaughtering packers and convert them into processed meat items, often packaged and sold to retailers under locally recognized brands.

As long as meat was retailed primarily at local butcher shops, these were the primary forms of wholesale distribution to retailers.

A spin-off from the independent processors was the specialized supplier serving the needs of the food service or HRI (hotels, restaurants and institutions) trade. HRI purveyors meet the specialized requirements of the institutional trade, often manufacturing shipped and size-portion controlled cuts.

As processing became a separate subsector of the meat industry, brokers became intermediary agents for slaughtering meat packers selling part of the carcasses or wholesale cuts in carload lots to nonslaughtering meat processors.

The biggest shift in meat wholesaling followed changes in the structure of food retailing, beginning about 1950. Technological development of satisfactory methods of prepackaging meat permitted customer self-service selection and purchase in retail outlets. This meat department, self-service breakthrough removed a previous restrictive barrier to size growth for retail food outlets. It permitted the later development of supermarkets, the usual outlets for local, regional and national food chains.

A second requisite to the supermarket development was the general acceptance of Federal grade standards as a descriptive system in trading beef. Federal grading standards for beef had been available since about World War I. However, they had been little used until grading was mandatory under the price-control period of World War II.

During the interval between World War II and the Korean episode price-control period, about 25 percent of wholesale beef was federally graded. After the Korean period, Federal grades became a dominant part of the language in trading beef at wholesale. Hams and bacon, and other cured and processed pork and sausage items, were branded items and could be bought by description. Acceptance of Federal grading permitted retailers to purchase beef by the carload from packers more than a thousand miles distance by telephone.

In the late 1950's chain-store central distribution centers were developed to service entire metropolitan areas, sometimes covering an entire State or parts of several States. Mass meat procurement from distant suppliers became a reality.

The demolition of 41st Street stockyards at 9th Avenue in New York City, as well as that of the Swift slaughtering plant, to make way for the United Nations Building during the 1950's heralded the end of several eras. On Manhattan Island it signaled the end of the livestock and meat trade. In the country, as a whole, it came simultaneously with the almost complete displacement of the individual butcher shop as the primary retail outlet for meat by larger supermarkets and food chains. It also marked the virtual end of meat wholesaling by personal inspection and selection by meat retailer customers. Meat became a commodity that could be sold by description at wholesale, with buyers and sellers separated by great distances.

The most significant historical epoch in meat wholesaling that ended in the 1950's was that of face-to-face negotiation, where buyer, seller, and product being traded were all in the same location. Mass distribution at wholesale with buyers dealing with distant sellers, communicating by phone with a commonly understood descriptive language, and dealing in carload or truckload lots became the dominant system of trading.

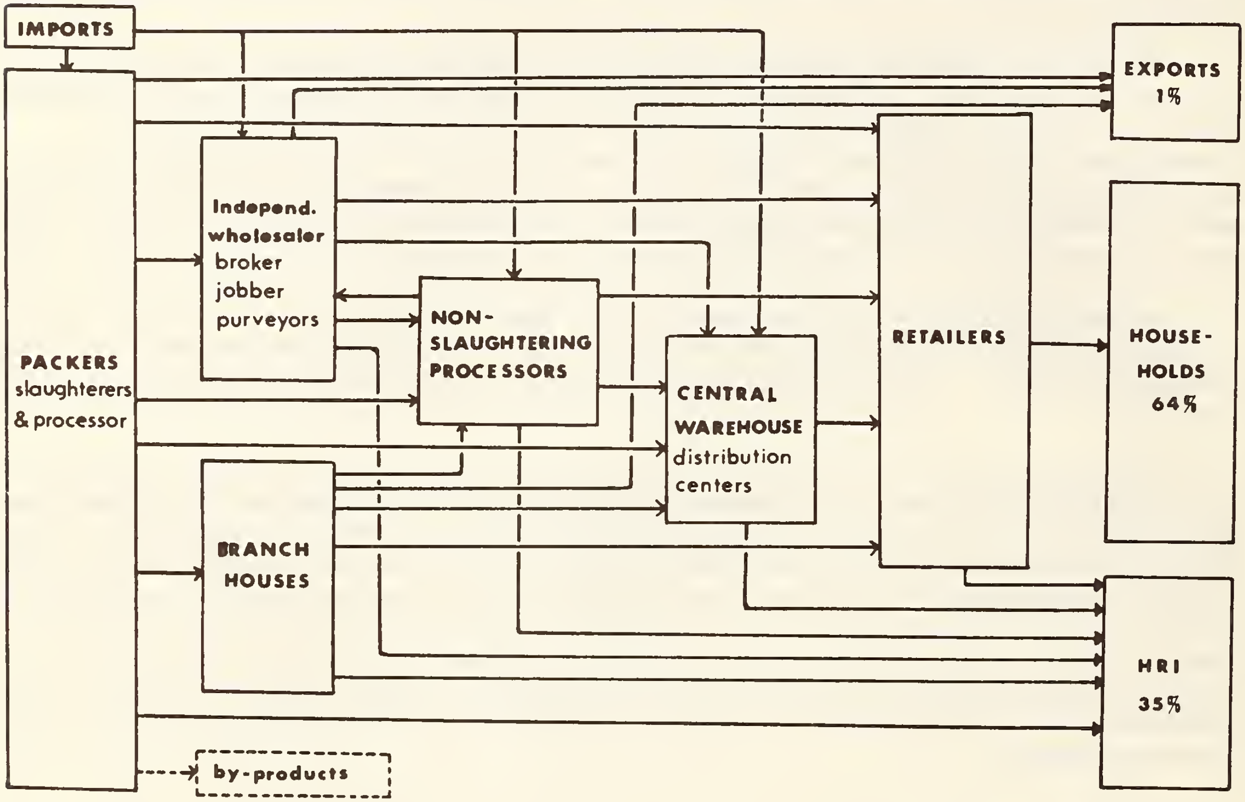
THE STRUCTURE OF THE WHOLESALE MEAT INDUSTRY

The shape and size of the various segments of the wholesale meat industry are difficult to describe or quantify. Years ago, before refrigeration, most processing was done by retailers. As livestock slaughter separated from retailing, much of the smoking, curing, and sausage and other manufacturing activities remained with slaughtering activity. When other distinctively wholesale institutions, such as packer-owned branch houses and independent wholesalers first developed, they were essentially meat handlers. Gradually, these wholesale facilities took on many of the processing functions. Most now supply specialized services of various types to their customers.

The general product flows of meat and meat products from slaughter to retailers and to hotels, restaurants, and other food services in contemporary meat wholesaling are conceptualized in figure 1. The lines of product flow

Figure 1

Schematic Diagram of Meat Marketing Channels*



*From John McCoy, *Livestock and Meat Marketing,* published by AVI Publishing Co., Westport, Connecticut.

and the various institutions represented comprise a highly skeletonized view of the industry structure.

The central warehouse distribution center, as a separate institution, is an extension of the retail food chain-store receiving dock function, to which has been added a number of processing functions that can be advantageously handled close to retail outlets. Conceptually, the independent nonslaughtering processor grew out of the gradual geographic shift of the slaughtering industry from one that was consumption oriented to one that is now based close to livestock suppliers.

Originally, packer branch houses were simply handlers close to retail outlets. They were extended shipping docks for distant slaughter plants. Gradually, over time, they assumed a number of processing and manufacturing activities to service the particular needs of their retailer customers. Independent wholesalers, who were the distribution arms of independent slaughtering plants, gradually took on processing functions. In later census years, the distinction between independent wholesalers and nonslaughtering processors has become blurred.

Except for lines between packers and branch houses and between central warehouses and retailers, product-flow lines between the several institutions in figure 1 represent changes in product ownership during the flow of meat from meat packer to the ultimate consumer.

The heterogeneity of functions carried on between slaughtering and retailing is suggested from the variety of names that are attached to different wholesaling firms. Brokers, processors, wholesalers, breakers, fabricators, boners, jobbers, sausage kitchens, canners, provisioners, HRI suppliers, purveyors--these names reflect a part of the functions carried on within the wholesale movement from meat packer to retailers and to the institutional trade.

Data from the Census of Manufacturing and Census of Wholesaling (table 1) are informative in that they reflect the changing structure of meat wholesaling over time. However, dollar figures for volume are not strictly comparable between different types of wholesale institutions because of differences in value added. Also, it is not possible to isolate the meat handled by food-chain central distributing plants for recent census years. Nevertheless, it appears that at least half of the meat changes ownership more than once during wholesale movement from slaughterer to retailer or eating establishments.

The broker function is one that is less difficult to classify according to census categories. About 6.5 percent of the wholesale meats shipped to meat packers in 1972 was sold through wholesale meat brokers, usually in truckload or multiple-truck, or carload lots. This trade is primarily between meat packers or between meat packers and processors.

LOCATION OF SLAUGHTER - THE GEOGRAPHIC ORIGIN OF WHOLESALE MEAT MOVEMENTS

The first suppliers of wholesale meat are the slaughterers of livestock, the firms that convert live animals into carcasses, wholesale cuts and other

Table 1.--Meat slaughtering plants, processing plants, packer sales branches, meat merchant wholesalers, brokers, number and dollar volume, census years 1929-72

Census years	Meat packing plants	Processing plants 1/	Packer sales branch offices	Meat merchant wholesalers	Brokers
		Number of establishments			
1929	1,277	...	1,157	2,225	...
1948	2,154 2/	...	756	3,200	...
1958	2,810	1,494	522	4,482	154
1967	2,697	1,374	616	5,041	163
1972	2,475	1,311	464	4,847	245
		Shipments and sales (million dollars)			
1929	3,435 3/	...	1,923	690	...
1948	8,970 2/	...	2,810	1,977	...
1958	11,972	2,066	2,263	3,891	609
1967	15,576	3,008	2,811	7,395	853
1972	23,024	4,632	4,251	12,611	1,471

1/ In census publication called Sausages and Other Prepared Meats.
2/ Meat packing figures are for 1947.
3/ "Value of production" rather than "value of shipments" used prior to 1947.
Source: U.S. Department of Commerce.

meat products. Before the Civil War, these were mostly located near large urban centers. As noted before, livestock were shipped long distances from the farms where they were born, grown, and fed, to where they were slaughtered.

The refrigerated car was developed by Gustavus L. Swift in 1870. This made possible the shipment of fresh meat for distances of more than 1,000 miles. It enabled the location of slaughtering plants close to available livestock supplies. The shift toward a supply-oriented industry was gradually and slowly made. Today more than 90 percent of livestock are slaughtered within the same State or adjacent States to farms, ranches, and feedlots where they become available.

Figure 2 shows the distribution of steer and heifer slaughter by States. About 90 percent of steers and heifers in the last 10 years have been grain-fed cattle, largely yielding Choice grade carcasses. These are livestock that supply almost all the fresh beef displayed in retail counters in the United States. Concentration of slaughter is west of the Mississippi. A triangle of States from Minnesota to Texas to Colorado accounts for about 70 percent of steer and heifer slaughter. This area includes the States where most of the animals are fed. Other areas of feeding include the Eastern Corn Belt States, California and Arizona, and the Pacific Northwest.

In figure 3, cow and bull slaughter is shown for 1977. From 20 to 30 percent of the cows in the country are of dairy breeding. The remainder is a part of the beef herd, kept for raising the calves that move into feedlots. Cow slaughter represents a salvage operation. Cows are slaughtered when their present value for meat exceeds their expected value for continued milk or calf production and for deferred slaughter. Thus, Wisconsin and Minnesota, important dairy States, supply nearly 17 percent of the cow slaughter. Cows slaughtered in the Northeast and in California come mainly from dairy herds. The distribution of cow slaughter in the Midwest and South represents cullings from cow-calf herds in beef breeding. Texas, the largest producer of beef calves, is the largest cow slaughtering State. Much of the boneless beef from U.S. cow slaughter is used for processing. Increasing proportions of this beef are being sold fresh as hamburger.

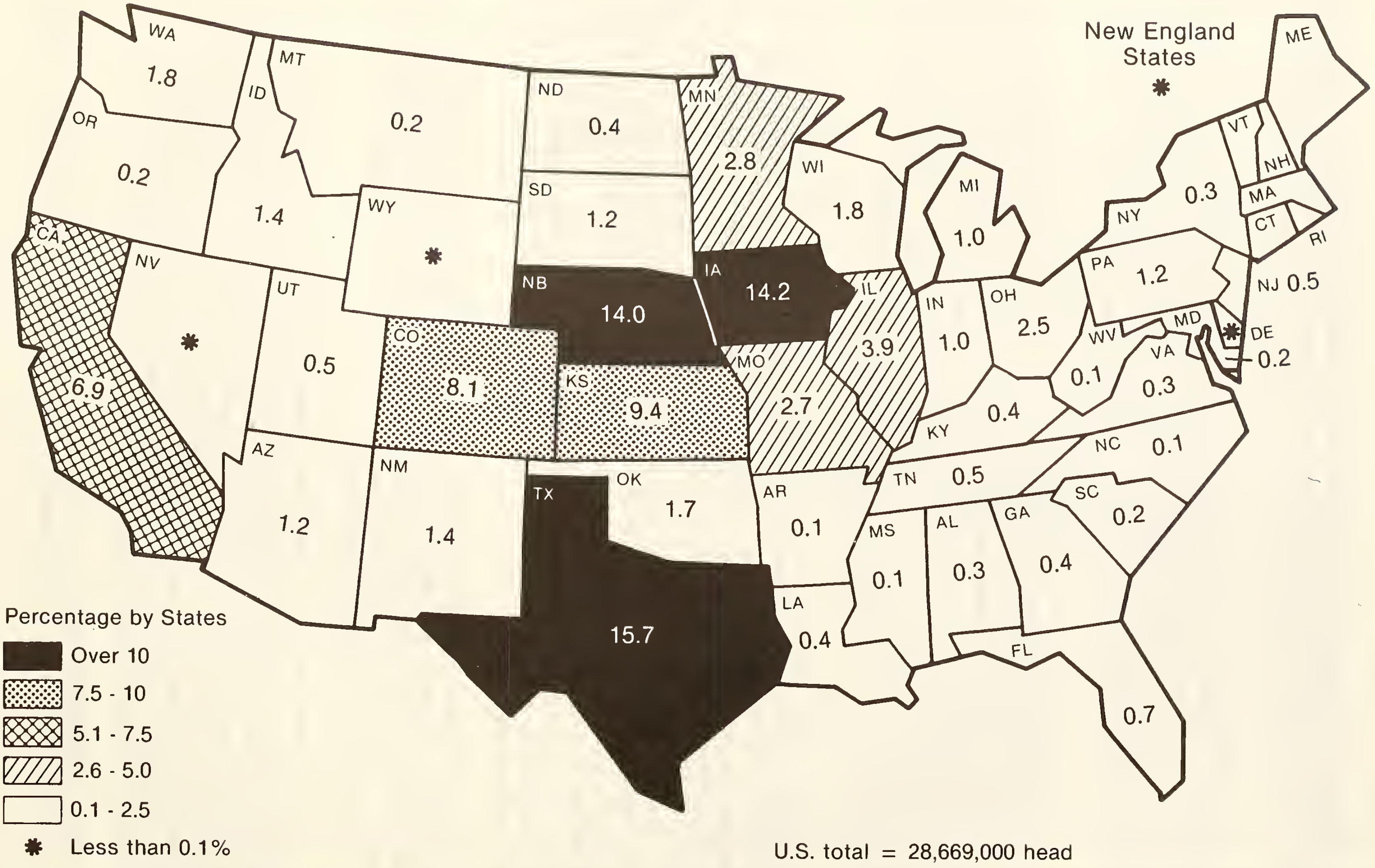
Figure 4 shows the distribution of hog slaughter in 1977 by States. Iowa packing plants produce almost one-fourth of the pork of this country. The 12 North Central States together slaughter about two-thirds of the hogs in this country. The production of hogs and of pork is also important in Pennsylvania and in several of the Southern States.

In 1977 beef and veal comprised about 65 percent of the red meat produced in this country. Pork accounted for 34 percent. The remaining 1 percent was supplied by the slaughter of lamb and mutton. The distribution of red meat production by States in this country is shown in figure 5. This represents a summation of the data underlying previous figures. The North Central States collectively account for more than 55 percent of the meat production. Adding Texas, Oklahoma, and Colorado to this concentration brings the central concentrated area of red meat production up to about 72 percent.

The wholesale market for meat tends to be a national market. Wholesale prices for fed-beef carcasses and cuts, fresh or frozen pork cuts, and fresh or

Figure 2

Steer and Heifer Slaughter, 1977

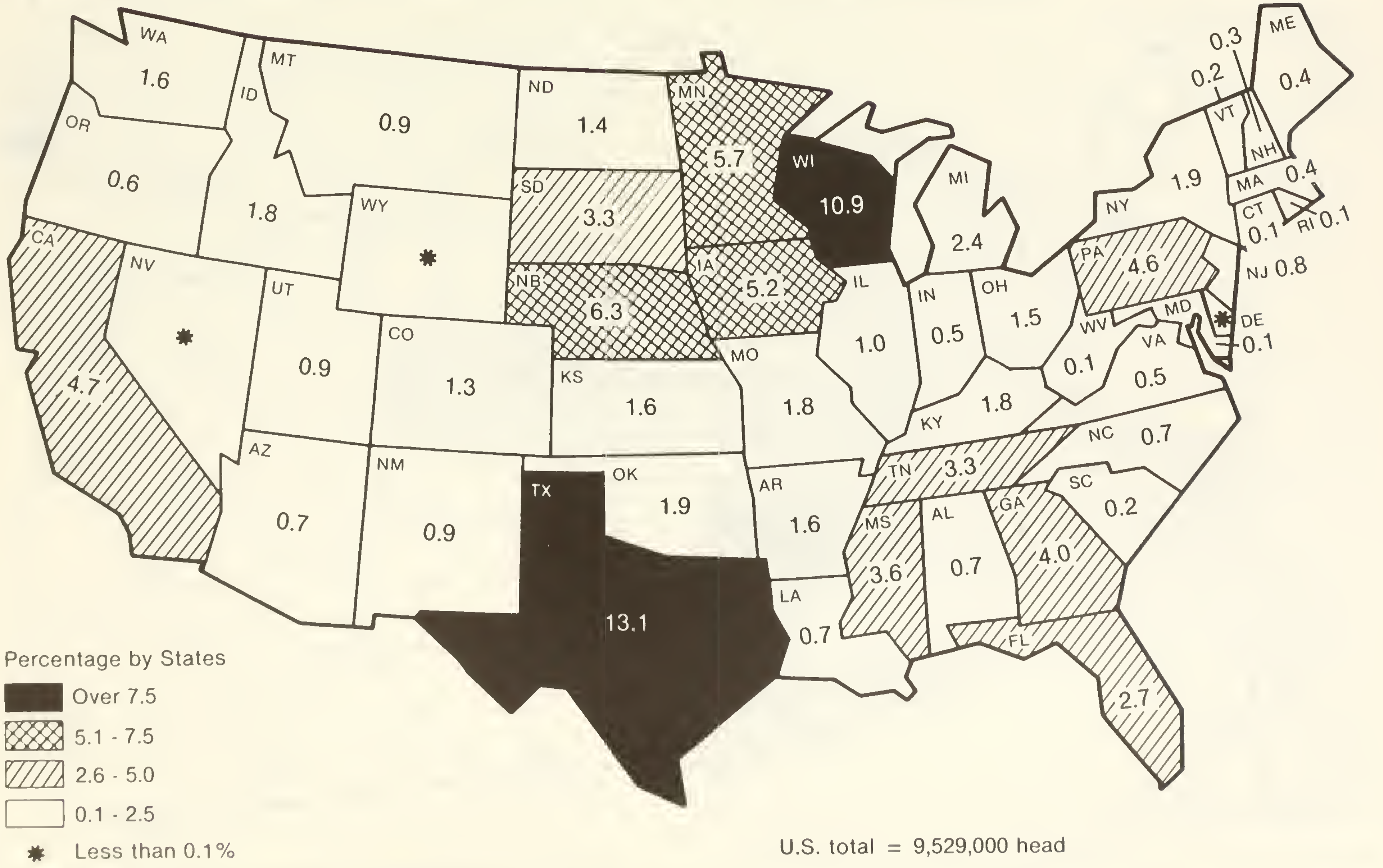


U.S. total = 28,669,000 head

Source: Packers and stockyards resume.

Figure 3

Cow and Bull Slaughter, 1977



U.S. total = 9,529,000 head

Figure 4

Commercial Hog Slaughter, 1977

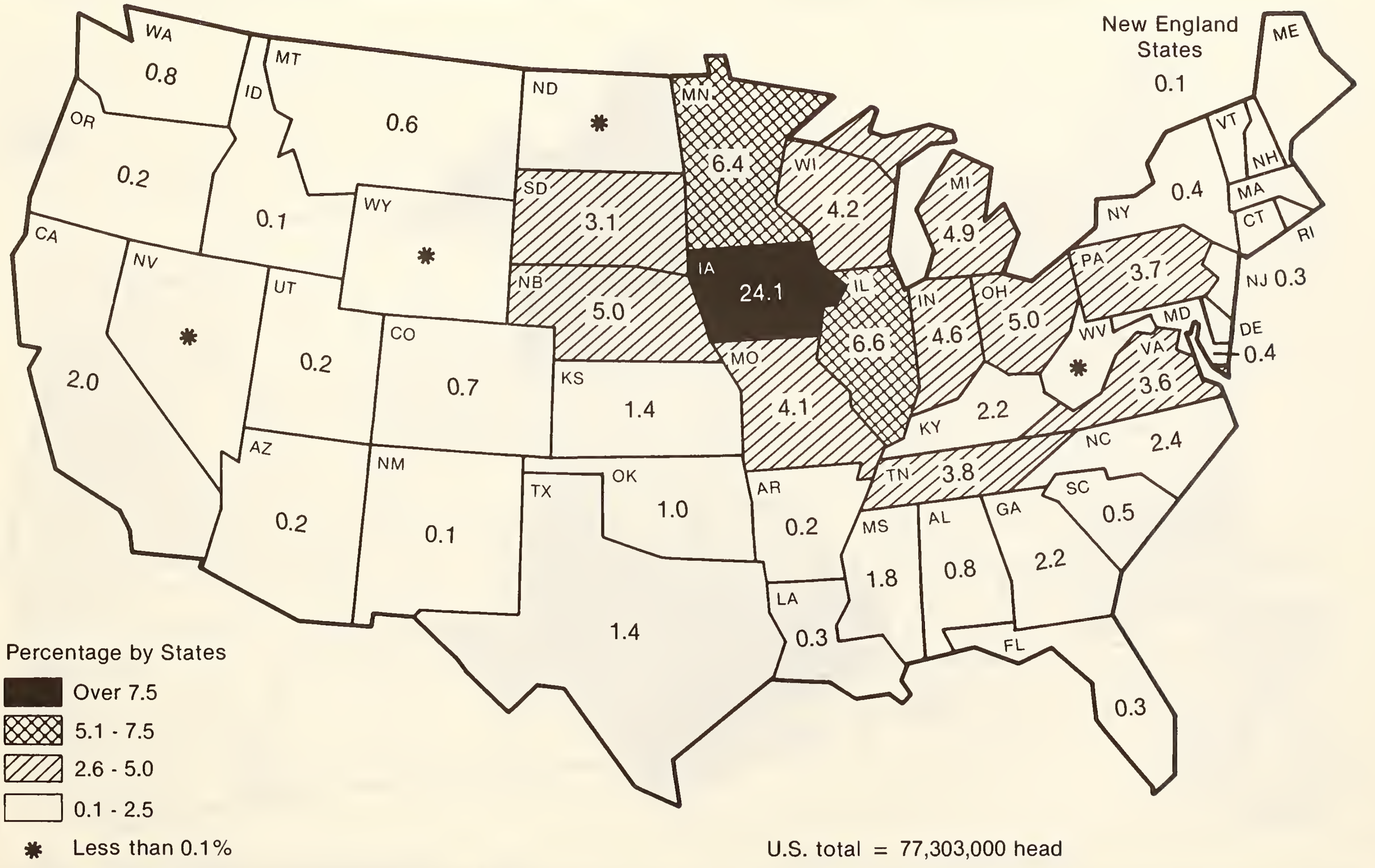
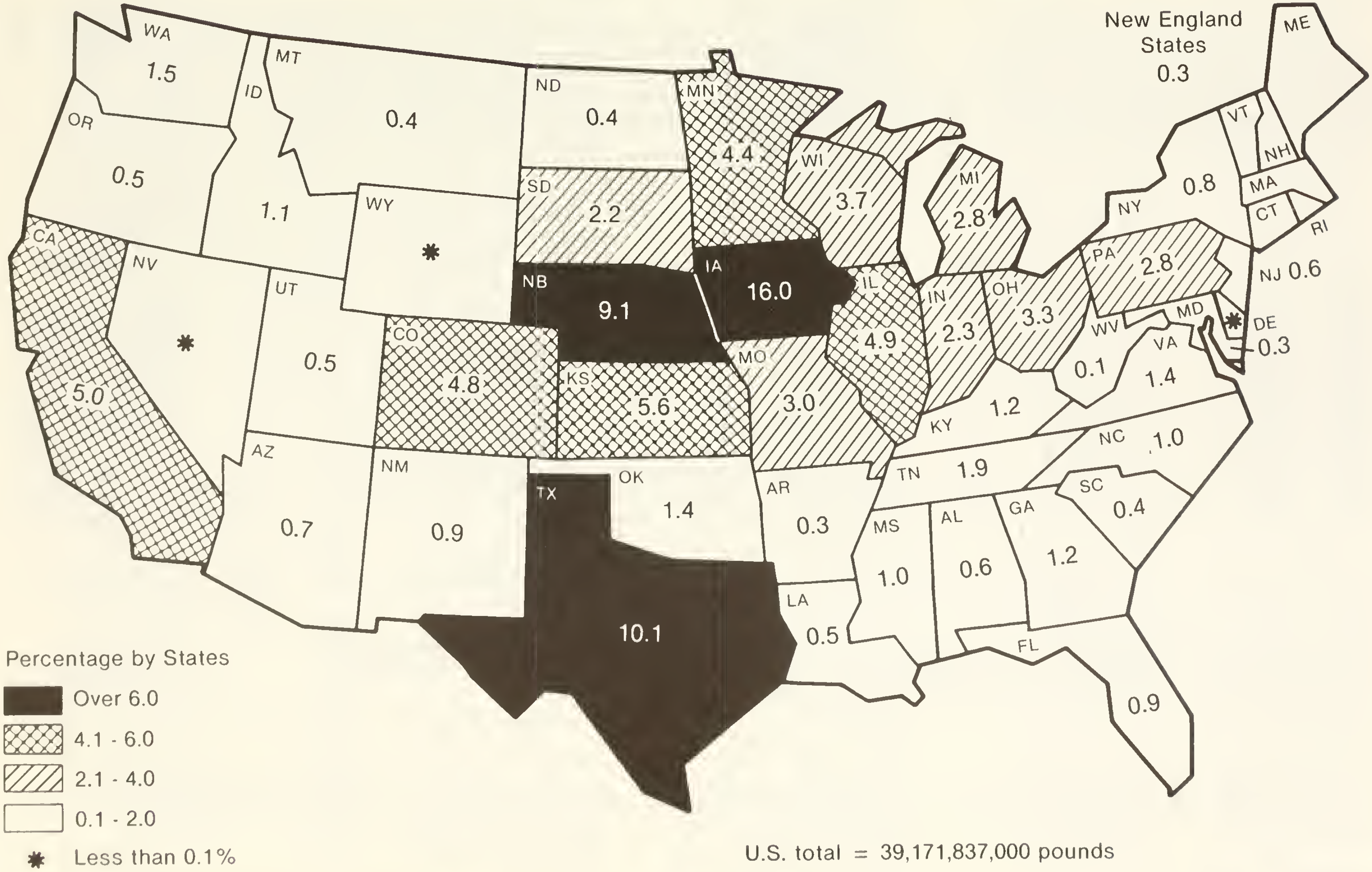


Figure 5

Red Meat Production, 1977



U.S. total = 39,171,837,000 pounds

Table 2.--Distribution of numbers, percentages, and cumulative percentages of cattle and hogs slaughtered, and slaughtering firms, 1976

Size group (1,000 head)	Cattle						Hogs					
	Firms 1/		Slaughter		Cum. Pct.		Firms 1/		Slaughter		Cum. Pct.	
	No.	Pct.	No. of head (000)	Percent	Firms	Sltr.	No.	Pct.	No. of head (000)	Percent	Firms	Sltr.
Unreported slaughter 2/	...	...	5,389	12.6	...	12.6	...	...	5,163	7.0	...	7.0
Under 50	640	81.2	6,359	14.9	81.2	27.5	360	80.4	2,587	3.5	80.4	10.5
50 to 100	85	10.8	6,144	14.4	92.0	41.9	20	4.5	1,316	1.8	84.8	12.3
100 to 250	37	4.7	5,135	12.0	96.7	53.9	23	5.1	3,742	5.1	89.9	17.4
250 to 500	15	1.9	5,466	12.8	98.6	66.7	13	2.9	4,715	6.4	92.8	23.8
500 to 750	2	0.3	1,175	2.8	98.9	69.5	11	2.5	6,651	9.0	95.3	32.8
750 to 1,000	3	0.4	2,626	6.2	99.2	75.7	8	1.8	7,010	9.5	97.1	42.3
1,000 to 2,000	6 3/	0.8 3/	10,360 3/	24.3 3/	...	...	6	1.3	8,624	11.7	98.4	54.0
2,000 to 4,000	...	...	...	...	...	...	2	0.4	5,965	8.1	98.9	62.1
4,000 to 8,000	...	...	...	...	100.0	100.0	5	1.1	28,011	37.9	100.0	100.0
P&S Total	788	100.0	...	...	...	...	448	100.0	...	...	...	...
Total Commercial	...	...	42,654	100.0	...	...	...	...	73,784	100.0	...	...

1/ Firms reporting to Packers and Stockyards, Agricultural Marketing Service, U.S. Department of Agriculture. In 1976 this excluded firms that slaughtered less than 1,000 cattle, or less than 2,000 of all species combined, during the year. In 1976 these firms accounted for 87 percent of commercial slaughter of cattle, and 93 percent of hogs.

2/ Slaughter by firms not reporting to Packers and Stockyards, AMS, USDA.

3/ Two firms slaughtered more than 2 million cattle in 1976. Data included in 1 to 2 million category to avoid disclosure of volume.

frozen processed meats on the East and West Coasts rarely differ by more than transportation costs. Meat moves both eastward and westward from the most concentrated areas of production. For fed-beef carcasses, eastern Colorado, southwestern Kansas, and the Texas and Oklahoma Panhandles tend to be the "divide" with carcasses flowing both eastward and westward. Carload movements of pork move both eastward and westward from Omaha and from other plants in States adjacent to the Missouri River.

Processed meats such as smoked and cured bacon and hams, as well as sausage meats, are privately branded. Here wholesale markets are often localized by various metropolitan consuming areas according to the brands that have been advertised and have local acceptance. There is a substantial movement of fresh or frozen meat to local processing plants or sausage kitchens near concentrated consuming areas. The local plants may be owned by parent slaughtering firms, but in many cases are independent firms.

THE STRUCTURE OF THE LIVESTOCK SLAUGHTERING INDUSTRY

Meat packers vary widely in the numbers of livestock they handle. The meat packing industry includes rather large numbers of very small-size firms, but the larger proportion of business is done by relatively few large firms. The 1972 census counted 2,475 meat packing plants. In 1976 packers slaughtering more than 1,000 head of cattle, or a combination of 2,000 head of all species, were required to file annual reports with the Packers and Stockyards (P&S) program, Agricultural Marketing Service, U.S. Department of Agriculture. The 923 firms that reported handled about 87.4 percent of the total commercial slaughter of cattle and about 93 percent of commercially slaughtered hogs. The remaining portions of the livestock supply were handled by very small packers, those that handled less than 20 cattle, or the approximate equivalent, each week.

Size distributions of meat packing firms that handle cattle and those that handle hogs are shown in table 2. Of the 788 firms reporting cattle slaughter in 1976, 148 larger firms--those that handled more than 50,000 head of cattle--accounted for 72.5 percent of the cattle commercially slaughtered in this country. Of the 488 reporting firms handling hogs, the 32 largest firms--handling more than 500,000 a year, accounted for 76.2 percent of hogs slaughtered commercially. Of the 2,475 firms counted in the last census, those not reporting to P&S, account for relatively small numbers, 12.6 percent of the cattle (mostly cows) and 7.0 percent of the hogs.

Hog slaughter is somewhat more concentrated than cattle slaughter. Ten hog slaughterers account for half of the total supply. It takes about 50 firms to account for half of the beef supply.

THE SIZE OF THE WHOLESALE MEAT BUSINESS

In 1978 more than 38 billion pounds of meat were produced from livestock in the meat packing industry. This included 24 billion pounds of beef, 13.2 billion pounds of pork (excluding lard), 600 million pounds of veal, and 300 million pounds of lamb and mutton. If we assume 40,000 pounds per truck (somewhat larger than the average load), this amount of meat would be equivalent to 950,000 truckloads a year, over 3,600 truckloads a day during a five-day week.

However, all meat does not leave the originating packing plant in fresh, unprocessed form. Beef is primarily sold fresh. But some beef is processed in the home plant. Less than half of the steer and heifer beef is fabricated and boxed in the plant where slaughtered, losing about 20 percent of its original carcass weight. Much of the cow beef is boned out in the home plant. On the other hand, some beef moves twice in fresh form, once in carcass, between packers or between packer and processor, and once again in fabricated fresh form. A 20-percent reduction of wholesale weight can be assumed in these operations. However, this would still leave 19 billion pounds of fresh beef leaving the home plant, or 480,000 truckloads a year.

In pork operations, an estimated two-thirds of the hams and bacon are smoked, cured, and processed in the home plant. But most of the remaining pork cuts, pork trimmings, and by-product foods are first sold fresh or frozen. At least half of pork cuts and other pork items are estimated to be sold in fresh form. This would amount to 6.6 billion pounds sold in fresh or frozen, unbranded form--some 160,000 truckloads a year.

Fresh and frozen beef and pork shipments add up to about 640,000 truck movements a year, over 2,400 a day during a five-day week. This is a substantial volume of a high-value wholesale food product, much of it worth more than a dollar a pound in early 1979, that moves in fresh or frozen, unbranded form. This gives some notion of the dimensions of the trading that is the subject of this report.

WHOLESALE MEAT PRICING - EMERGING PROBLEMS

When meat was still sold by face-to-face negotiations, with product present for inspection, sale and delivery were practically simultaneous. The selling of meat by description, with long-distance communication between buyer and seller, broadened the practice of negotiation prior to shipment. This opened up flexibility in the timing of sales. Retailers want to maintain a flow of meat supplies. Packers with inventories in the pipeline like to sell products, even before availability for shipment. With telephone selling it became possible to commit the product as soon as livestock were bought. With the existing variety of meat products over all sections of the country, the pipeline has been estimated to average about 10 days between livestock slaughter and delivery to retail outlets.

Some wholesale buyers have verbal standing orders with meat suppliers to take certain quantities in truckload lots several weeks, and even months, into the future. Such oral arrangements are always conditioned by availability of supplies, and, in any event, are easily terminated.

Conceptually, the timing of selling meat at wholesale can be divided into three time frames: first, sale for immediate shipment and delivery; second, sale within the pipeline for delivery within 10 days or 2 weeks; and third, sales well in advance of slaughter and purchase.

Since the middle of the 1960's, problems in wholesale meat pricing have become matters of significant public concern and controversy, as pricing methods have departed from negotiation of transaction prices.

Traditional methods of sale had involved a price negotiated by buyer and seller with simultaneous delivery or product. When much of the product selling began to be negotiated before delivery, formula pricing began growing in importance. The usual practice in formula selling is to base the transaction price on a market quotation taken from a private market news service for the wholesale meat trade on a future date. Differences from the forward base price, for transportation costs and other special circumstances, are negotiated. But the final transaction price is not known until the relevant basis price is reported. The usual basis price is the day before shipment.

Problems associated with formula pricing stem from the erosion of the base of negotiated transaction prices upon which accurate price quotations can be established. Because negotiated price sales are relatively few, information on them is difficult to collect. Information is so scattered, so fragmented, and so limited that it is a formidable task, if even possible, to determine what happened in the market on a given day. This has been called the "thin market" problem in the wholesale meat trade which makes accurate price reporting difficult for market news services.

In a study of a judgment sample of sales records from 35 plants, each having more than 60,000 head slaughtered per year for July 1977, 70 percent of the steer and heifer carcass shipments were sold on formula-based prices. 1/ Of the 30 percent of sales in which price was actually negotiated, half (or 15 percent of the total) was sold as special trim, special delivery, or special selection, or was discounted for bruises and other reasons. This leaves 15 percent of steer and heifer carcass sales that were eligible to be reported.

Only 1.7 percent of actual federally inspected slaughter appeared on logs of actual trades of the major private reporting service. For the 20 business days from July 1 through 29, 1977, only 75 sales of Choice yield grade 1-3, 500-900 pound steers were reported, or an average of 3.8 sales per business day. 2/ On 13 of the 20 days, three sales or fewer were reported. On 7 of the 20 days, two sales or fewer were reported.

With such fragmentary sources of market information, the variability of negotiated prices becomes more of a concern. In the Beef Pricing Report the variations of negotiated prices for Choice yield grade 1-3 steer carcasses was such that at the same location, one out of three sales could be expected to be more than 80 cents, either above or below the average price. 3/ One out of 20 would be above or below the average by more than $1.60 per 100 pounds. Thus, a reported price at the extremes, with only three sales or less logged, could easily contribute to a sizable statistical error in the quoted price on any given day. In July 1977, when these sales were analyzed, price levels were between $60 and $65 per 100 pounds. Transaction prices were breaking at 25 or 50-cent intervals. In January 1979, when Choice steer carcasses were priced around $95, one sale out of three could be expected to differ from the average,

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1/ Beef Pricing Report, Packers and Stockyards program, Agricultural Marketing Service, U.S. Department of Agriculture, December 1978, p. 12.
2/ Ibid., p. 26.
3/ Standard error was 80 cents per 100 pounds.

either above or below, by more than $1.20 per 100 pounds--1 sale out of 20 by more than $2.40. This is an illustration of what is meant by a "thin market" for reporting purposes. Reporting accurate quotations is difficult in markets thinly traded.

Although no comparable analysis has been undertaken of price reporting for conventional primal cuts of beef and wholesale cuts of pork, there is evidence that the shortage of negotiated transactions is more critical. This makes accurate price reporting even more difficult for these items. 4/

However, fabricated cuts in the boxed beef trade are primarily traded with negotiated transaction prices. This trade involves a rather large variety of cuts that have most of their excess fat and bone removed in the processing plant. These new cutting procedures have been developed relatively recently. Formula trading in boxed beef is only beginning. Price variations in the order of 10 percent or more make the single price quote or private reporting services a less reliable indicator of average selling price. Formula trading can be expected to increase as these more closely trimmed cuts become more widely used.

ELECTRONIC TRADING SYSTEMS

An electronic trading system includes the electronic equipment, trade language, and procedures that can bring a number of buyers and sellers together simultaneously to make transactions. Such a system creates a large central (regional, national or international) market in place of many small, local markets without requiring all buyers, sellers and products to be at a single location. Hence, electronic trading systems can achieve a high level of pricing efficiency and a high level of operational or physical efficiency.

Historical Perspective on Types of Systems

Electronic trading systems for U.S. agricultural products began simply with an auction conducted over a conference telephone call to about a dozen buyers in 1963. This first teleauction sold slaughter hogs from Virginia to meat packers in Virginia and nearby States. Since then, other teleauctions have been used to trade slaughter cattle and lambs, as well as feeder pigs and feeder cattle, in several States. In 1961 producers in Ontario, Canada, introduced a "Dutch" (descending bid) auction conducted over teletype equipment to sell slaughter hogs. Generally, the teletype is faster and has capacity to connect far more buyers to the system than the teleauction. The teletype also produces a printed record and confirmation of all transactions.

In 1975, Plains Cotton Cooperative Association (PCCA), Lubbock, Tex., introduced TELCOT, a computerized system of bringing buyers and sellers together. Originally, buyers and sellers telephoned Lubbock where an operator accessed the computer for them. Now, buyers and sellers access the system directly by remote terminals. These terminals consist of keyboards to make input, and TV-

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4/ Testimony of Nick Wultich, investigator, Small Business Problems in the Marketing of Meat and Other Commodities (Part I - Meat Marketing), Hearings of Committee on Small Business, House of Representatives, 95th Cong., 2nd Sess., 1978.

like cathode ray tubes (CRT's) and printers to receive output.

In contrast with the teleauction and teletype system, the computerized system can handle a much larger number of transactions per hour, execute them more automatically, and complete a number of bookkeeping routines. The computerized system has a much larger fixed cost and smaller variable cost of operation than teleauction or teletype, resulting in very low per-unit costs with a high volume of trading. The simpler teleauction system is more economical for a low volume of transactions because no special equipment or training is needed. The teletype is an intermediate approach.

Often a telephone is used to contact potential trading partners, but this is slow and inefficient compared with computerized electronic trading systems. The teleauction allows simultaneous contact with only about 15 buyers. Teletype can be used to send a message to hundreds of traders simultaneously, but it can send only one message at a time. The computerized system can send different messages simultaneously to different types of traders and allow traders to call for any message in the system whenever they want it.

Any system operating with a sizable volume on a national scale or even regional scale should be computerized to be practical. A computerized system can receive, process, store, retrieve and send information. Furthermore, it can accomplish these functions at the speed of light and with impeccable accuracy. A computer can be addressed by hundreds of buyers and sellers at alternative geographic points almost simultaneously. Various computer subroutines can be used to give flexibility to the system, making it suitable to the needs of a variety of traders.

A number of computerized, electronic data handling systems are in use today in scientific, educational, governmental, and business applications. The focus of the next two sections will be on business applications used to (1) improve communications among buyers and sellers, and (2) complete transactions. Computerized business applications in agricultural and nonagricultural commerce are included so that inferences can be made about the feasibility of a wholesale red meat trading system.

Computerized Information Systems

A number of computerized information systems are now being used to provide traders with valuable information about potential transactions, but the systems are not used to execute transactions. An everyday example, which we take for granted, is the airline reservation system which uses computers to keep an inventory of seats on scheduled airlines. The system can be accessed directly via a number of remote terminals, or indirectly by telephone to a terminal operator for an instant update of seat availability. The system reserves each entrant a seat by class and records name and phone number. Without the aid of computers the task of keeping reservations, making changes, and writing tickets would be slow and burdensome for the 205 million revenue passengers enplaned on domestic airlines each year. 5/

5/ 1975 data from The World Almanac and Book of Facts, 1977.

Large car rental companies use computers to not only reserve the kind of car you need at appropriate location but to fill out rental contracts and compute charges. The car may be ordered from one city, picked up in another, and dropped off in a third. Each local office has one or more terminals connected to a single computer that keeps current on the whole transaction.

The Autex Division of ITEL Corporation provides an information system for traders of large blocks of corporate securities. The system provides broker-dealers and financial institutions with information about specific blocks of stock available for sale or desired for purchase. Based on information received from the Autex system, broker-dealers and institutions communicate by telephone or an Autex message system and transactions are executed on a stock-exchange floor. Financial institutions subscribing to the service include banks, insurance companies; and State, mutual, private, corporate, and pension fund managers.

Autex has a larger potential market. In 1970 almost 70 percent of dollar volume in securities markets was generated by financial institutions. A similar Autex system is available for bonds. In both cases, Autex brings buyers and sellers of large blocks of stocks and bonds together. Without this system, buyers and sellers would have difficulty completing transactions without upsetting the market.

In the Government securities market, electronic information systems have been operating since 1973. One system is a "billboard" that securities dealers use to "advertise" their bids and offers (asking prices) on selected Government securities, such as Treasury bills. The prices, type of securities, and name of the dealer are flashed to the trade via CRT's. Large institutional traders and brokers view the screen and select the best price. The transaction is completed outside the system by telephone.

Another type of system for Government securities, of which three are in operation, permits execution of transactions. Each execution system is owned and operated by a sponsor who displays only the best bid and best offer for each security via CRT. To make a transaction at those prices, the subscriber must call the sponsor and buy or sell from him. The sponsor makes an opposite transaction almost simultaneously with the firm advertising the matching bid or offer.

Two of the execution systems are restricted only to dealers. The third permits nondealers, such as large institutions, to be active in the system, thus reducing some middleman activities.

Prior to the "billboard" and "execution" systems, customers would call a few dealers, usually those with whom they were accustomed to trading, and try to negotiate the best price. The market could change before many were contacted. Now customers can select from several dealers instantaneously. Likewise, dealers used to call customers in an attempt to make transactions, but now can advertise to several simultaneously as well as monitor activity of competing dealers. For the billboard service, both dealers and customers pay a rental fee. For the execution service, the sponsor charges a brokerage commission to be paid by the firm completing the buy or sell transaction. 6/

In February of 1979, Reuters Ltd., a worldwide commercial newswire service, began a computerized information system for international grain traders. Initially the system will enable exporters and brokerage firms to "advertise" individual bids and offers for large quantities of major grains (wheat, corn, soybeans, barley and sorghum). Later, other interested parties will be able to subscribe for the service. If the information system succeeds and sufficient interest is shown, the company plans to develop a mechanism for completing transactions.

An electronic information system for the wholesale, red meat market is not new. On February 19, 1960, Meat Products Clearinghouse, Inc. began a service of assembling and broadcasting information about carlot meat transactions of its subscribers. The effort was in response to intense dissatisfaction with then available information on current transactions.

As part of the subscription contract with Meat Products Clearinghouse, a packer agreed to report every carlot transaction of selected meat products giving (1) type of product, (2) area of origin, (3) area of destination, (4) quantity, (5) invoice price, (6) delivery terms (f.o.b. or delivered), and (7) hour of purchase.

This information was transmitted to the Clearinghouse by leased-wire teletype. It was received, processed, and summarized, and results were fed back to subscribers over the teletype at periodic intervals. At the end of the day, an hour-by-hour summary was prepared and broadcast to subscribers.

The Meat Products Clearinghouse system began with about 45 major packers, and shortly after its opening was reporting for over 50 percent of carlot beef and pork trades for the products selected for reporting.

The Clearinghouse system operated for only 12 to 18 months due to some financial problems. Large packers did not like the continuing burden of the fee schedule which was proportional to dollar sale volume and did not give them much more information than they had already. An anticipated number of retail chain buyers never did subscribe to the service. The system also lost credibility because of an inability to effectively verify transactions. 7/

Computerized Trading Systems

The following are examples of computerized trading systems currently in operation.

6/ For more information on these markets, see Kenneth D. Garbade, "Electronic Quotation Systems and the Market for Government Securities," Federal Reserve Bank of New York Quarterly Review, summer 1978, pp. 13-20.

7/ "A Revolution in Reporting," Meat, May 1960; and personal interviews and observations in 1960 by Allen B. Paul.

TELCOT.--Plains Cotton Cooperative Association (PCCA) was founded in 1953 to create a better market for west Texas cotton producers and to reduce marketing costs. From 1953 through 1974, the cooperative was obligated to bid on a producer-member's cotton at or near the current market level.

Each day PCCA would determine a market value for every quality of cotton, prepare a price catalogue, and deliver it to about 200 participating cooperative gins. The pricing process was complicated by the fact that west Texas cotton can have hundreds of different quality combinations, and each combination must be priced separately. Prices rarely could be changed during the day because of the problems of communicating prices on a large number of quality combinations to so many gins.

A grower wanting to sell his cotton would ask his ginner how much it was worth. A gin clerk would calculate an average, using PCCA's current prices, and perhaps solicit bids from two or three buyers. In about 30 minutes competing bids would be received. The grower could take the highest price, or refuse it and try again later.

This high-volume, low-cost system worked well for most of the 1953-74 period because the cotton market was dominated by Government price support programs and price fluctuations were small.

By 1970 PCCA had about 20,000 members and was buying over 500,000 bales of cotton annually. That was about one-third of the west Texas crop and 5 percent of the U.S. crop.

However, the situation all changed with the Agriculture Act of 1971 which exposed the cotton market to "free market" forces. In 1973 prices began to fluctuate widely. Communicating price changes to participating gins was difficult and PCCA was exposed to considerable price risks.

Faced with the changing market for cotton, PCCA developed TELCOT, a computerized information and trading system. Implemented in 1975, TELCOT significantly changed PCCA's procurement operation. The cooperative no longer had to bid on every bale of cotton a member wished to sell.

The current TELCOT system includes computer terminals in the offices of 41 major merchant-shippers (buyers) located in the major cotton trading centers of Lubbock and Dallas, Tex., and Memphis, Tenn. These merchants assemble and merchandise large lots of cotton to meet the special requirements of U.S. textile mills and also for export accounts. The buyers use their terminals to bid directly on cotton offered for sale by producers through computer terminals in 150 cooperative gins. As one of the buyers, PCCA purchases about 25 percent of the TELCOT cotton.

The TELCOT system now trades about 750,000 bales, or 37,500 transactions a year. PCCA is currently considering a proposal to add about 150 noncooperative gins in 1979. This would double the number of selling terminals as well as the volume of cotton traded in the electronic market.

Trading over TELCOT begins when a producer contacts his local gin and asks for a market price estimate of his lot(s) of cotton. The estimate is used by the producer to make the decision to enter TELCOT's "regular auction" market, or "firm offer" market, or to defer his sale until another time.

If the producer is satisfied with the estimate as a minimum price and chooses to enter the regular auction, the gin clerk enters the cotton. It appears on the CRT's of all buyers and sellers with a time of entry, and buyers have 15 minutes within which to make "blind" bids. (No buyer sees other buyer's bids.) At the end of 15 minutes the computer selects the highest bid and announces it to all buyers and sellers, unless that bid is more than one-fourth of a cent per pound below the estimate from TELCOT. If the highest bid is too low to be acceptable, a "no sale" is reported.

If the producer believes the market will go higher than the TELCOT market price estimate, he may put his own price tag on the cotton in the firm offer market. Producers' offers are listed in order of ascending price and flashed to buyers. A buyer may accept an offer at any time by entering the asked price. A producer's offer remains on the list until it is accepted by a buyer or withdrawn by the producer. A producer may change his offer price any time until his cotton is sold.

PCCA spent about $750,000 to develop TELCOT (largely the software package). The operating cost of $2.50 per bale is paid by the buyer. Given the average lot size of 20 bales, each transaction costs an average of $50. The buyer also pays a monthly charge for his remote computer terminal and telephone line charges--a total of $350 for a CRT or $500 for a CRT and printer. Of the $2.50 commission fee, $1.50 is retained by PCCA for TELCOT expenses, and $1 is sent to the local gin for paying its expenses, including the $350 or $500 per month terminal rental.

The PCCA management staff estimates that TELCOT returns an additional one-half to one-cent per pound to producers in comparison with non-TELCOT cotton. In addition, the general price level in Texas-Oklahoma has probably been raised, but it is difficult to measure the magnitude of this change.

Some buyers have commented that the cost of maintaining their traditional system for buying cotton, including a number of country buyers, is in excess of the cost of using TELCOT. 8/

Egg Clearinghouse, Inc.--Like many perishable agricultural commodities, eggs were once traded in large metropolitan wholesale markets where many buyers and sellers gathered to negotiate prices and transfer ownership. As supermarket chains began to dominate food retailing and large food processors began buying eggs for processing, large quantities of eggs were bought direct on a specification basis. The wholesale markets shrank in volume and most have now disappeared. Currently, about 40 percent of eggs are produced by independent producers, but only about 10 percent is uncommitted in advance and subject to the open market.

8/ Personal interviews of large-volume merchants in Dallas, Tex., and Memphis, Tenn.

With the disappearance of the old wholesale markets, public price reporting also disappeared, and a certain amount of uncertainty surrounded the ensuing price process. "In the 1960's, Government officials found that a handful of individuals dominated egg trading. Under pressure from the Government, both the New York and Chicago mercantile exchanges ceased egg pricing in 1970 . . . ." 9/

Continuing through most of this history, a private market news service offered traders a private estimate of prices for specified grades of eggs, in 30-dozen cases in carlot quantities, in the New York area. In early years the prices largely were based on public market quotations. However, as public markets disappeared, prices were based on reports from a few individual traders, on information about general supply and demand conditions, and personal judgment of the market reporter. Similar price reports by other private firms have been available in the Boston and Chicago areas.

In the 1950's and 1960's considerable research was conducted on egg marketing and egg pricing. One of the findings showed an inability of prices from the private service to effectively clear the market. Researchers also explored alternative pricing systems. 10/ Out of this research came the blueprint for Egg Clearinghouse, Inc. (ECI), an electronic trading system to create a national wholesale market.

When ECI was founded in 1971, buyers and sellers called the organization's office to make bids and offers for eggs. These bids and offers were matched by hand after making adjustments for transportation. From 1972 to 1977, volume increased from 105,000 cases of eggs to 969,000 cases, and from 22 members to 284. As volume grew, a small computer was employed to automate the matching and recordkeeping process.

ECI is more than an information system publicizing the bids and offers of buyers and sellers. ECI is a trading system through which buyers and sellers make transactions. To gain the confidence of traders and encourage their use of this system, ECI guarantees the integrity of the transaction and the quality of products offered.

In November 1978, ECI began a new phase of electronic trading by placing remote terminals in the offices of buyers and sellers. This latest development permits direct access to the computer without having to interface with a human operator by telephone. The terminals consist of a keyboard and printer for sending and receiving trading information. The terminals are joined to the computer by conventional INWATS telephone lines.

ECI uses a four-phased pricing procedure. From opening to 9:45 a.m., blind bids and offers are made by buyers and sellers. That is, no trader knows the bid or offer of any other trader during the first session. If a bid and offer match, the successful traders are notified that a sale has been made. From 9:45 to

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9/ Washington Post, "Clearinghouse for Egg Trades Proves Success," September 5, 1978.

10/ Rogers, George B., and Leonard A. Voss, "Pricing System for Eggs," Market-Research Report No. 850, Economic Research Service, USDA, May 1969.

10:45 a.m., traders in the first session are permitted to adjust their bids and offers to make sales. From 10:45 to 11:15 a.m., new traders may enter to meet bids or offers carried over from the previous session. There is no commitment to leave a bid or offer after 11:15 a.m. The market is then repeated on the same schedule on Pacific time. 11/

The cost of operating ECI with remote terminals is expected to be one-half cent a dozen, or $112.50 for each lot of 750 30-dozen cases of eggs. In addition, each trader must pay the monthly computer terminal rental of $150 or make an outright purchase of $2,200. Traders must also pay a one-time membership fee of $35 and a monthly assessment of $25. In 1978-79, ECI handled 1,050-1,300 lots of eggs, 750 cases each. Average transaction cost per lot is much higher than for TELCOT because of the much smaller volume of ECI over which to spread the large overhead expenses of computerized trading.

In general, it can be said that ECI is creating an open market for shell eggs. ECI has the advantages of electronic trading such as improved information among traders, efficient transactions, and direct movement of product from sellers to buyers.

Intermarket Trading System (ITS).--The 1975 amendments to the SEC Act require that the securities industry move toward a national market for corporate stocks. Such a market is needed to reduce price differentials among stock exchanges and to assure a buyer or seller of getting the best price available in the United States.

On April 17, 1978, the Intermarket Trading System was born, linking the trading floors of the New York, American, Boston, Philadelphia, Midwest, and Pacific stock exchanges. ITS uses CRT's to display the best bid and ask quotations on each exchange floor for a large number of publicly traded stocks.

Before executing a transaction on his own floor, a floor broker checks ITS to see if he can make a better trade on another stock exchange. If the quotation on his own floor is equal to or better than ITS, he ignores the other markets and proceeds on his own floor as usual. If, however, the ITS quotation is better, he can input his order into ITS to buy or sell on the specified exchange at the quoted price. The trader on the other exchange who "advertised" the bid or offer has two minutes to accept the order. He must accept it unless he is in the process of changing his quotation. Once the order is accepted, a transaction is completed and the result is reported back to the order originator via ITS. 12/

Cincinnati NMS (National Market System).--Cincinnati NMS is a more automated version of an electronic stock exchange than ITS. It was created by the Cincinnati Stock Exchange on July 13, 1978. Cincinnati NMS is a nationwide stock exchange in which the computer replaces the trading floor. It does not have trading posts

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11/ History and pricing procedures of ECI from "Proposal for Pilot Electronic Marketing Project by Egg Clearinghouse, Inc." submitted to the Agricultural Marketing Service, USDA.

12/ For more detail, see William C. Jelton, "Corporate Equities and the National Market System" Federal Reserve Bank of New York Quarterly Review, winter 1978-79, pp. 13-25.

for each corporate issue where brokers call out their orders to buy or sell at specified prices. It does not have floor specialists or their books of limit orders to be executed at specified prices. Nor are there market makers tending selected trading posts who are always willing to buy or sell an issue at a price. Brokers, specialists, and market makers located anywhere in the United States may enter Cincinnati NMS by remote CRT terminals. The terminals are connected to computers that receive buy-and-sell orders, match them for transactions, keep the specialists' books of bids and offers, generate market information from past transactions, and perform a myriad of recordkeeping functions.

> "All orders for the account of a public customer, regardless of time of entry, have priority over an order for the account of a market maker at the same price. Thus, you have the 'book' incorporated into the market. Market makers can participate by entering their bids and offers into the book or by standing in the 'crowd'. Both brokers and market makers can stand in the crowd. That is, they can just watch the action (on CRT screen) and step in with their buy and sell order when they wish. Of course, when a broker in the crowd steps in, the computer gives priority to orders at the same or better price which have already been committed. However, he will go ahead of members of the industry buying or selling for their own account." 13/

By computerizing the stock exchange, traders have more timely information for making transactions. A trader need only touch a few keys and watch his CRT to check the status of his orders in various "limit order books." A public customer can wait on the phone while his broker immediately becomes a part of the crowd checking on a specific stock. If they like the going price, the broker can enter his bid or offer for an instantaneous response. There is no waiting for the broker to call his floor trader who runs to the appropriate trading post, makes a transaction if the price is right and returns a call to the customer's broker who then calls the customer.

> "One selling point for the Cincinnati system is that its costs are competitive. Merrill Lynch says that the Cincinnati's one-cent-per-share transaction fee is about equal to Merrill Lynch's cost of doing business on the Big Board; the latter expense is divided between transaction fees to the exchange itself and 'floor brokerage' fees to specialists executing limit orders.
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> "On the Cincinnati, of course, there isn't any floor brokerage, a fact that could have large implications for the Big Board. The Cincinnati says that if it can get its daily volume up to half a million or a million shares from the current 45,000 (the Big Board's daily volume has been averaging over 28 million shares of this

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13/ "Eleven Tough Questions to Ask About the Cincinnati NMS and What You Should Expect to Hear," the Cincinnati Stock Exchange.

> year), it can cut fees to large-scale users even further, say to a half-cent or quarter-cent a share." 14/

Cincinnati NMS has been started on a very small scale to test the feasibility of such a system. Only two brokerage houses and specialists on four exchanges (Cincinnati, Pacific, Midwest, and Boston) have decided to participate, so far. Trading is limited to 40 stock issues and daily volume is about 60,000 to 70,000 shares. About 100,000 shares are needed to break even financially. The average cost per transaction is about \$3 to \$4 given an average lot of 300 to 400 shares sold at a fee of \$.01 per share.

If the system is accepted, it will revolutionize the securities trading industry. Principal buyers and sellers and their brokers will enjoy better information and lower transaction cost. Much of the savings will be due to the elimination of hundreds of trading floor positions necessary to support floor traders. Traders themselves will have to be retrained.

> "Those that stand to lose the most from the advent of a national automated trading system are those exchanges that do the most volume under the present system: the Big Board and the American Stock Exchange, or Amex. Both exchanges have sharply criticized the Cincinnati system in recent letters to the SEC.
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> "Among their allegations: The system fails to duplicate the openly competitive 'auction' market found on conventional trading floors; by letting Merrill Lynch and other firms fill orders from their own inventories, it leaves the market vulnerable to manipulation and conflicts of interest; and it lacks adequate surveillance against securities law violations.
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> "The boosters reply that the system decidedly is equivalent to an auction market--or will be when more firms are participating--and that its operations, closely monitored by the SEC, have served customers honestly so far. Moreover, they contend, electronic trading will be easier to police than conventional trading because of the 'audit trail' recorded in the computer's memory." 15/

ELECTRONIC SELLING FOR WHOLESALE MEAT - IS IT POSSIBLE?

When meat was primarily sold by inspection at the wholesale level, trading was bound and fragmented by both time and space. Buyer, seller, and wholesale product were all present at the same time and in the same place. Sellers had to negotiate with each buyer one-on-one, with different buyers one-on-one in sequence at different times--but with each of several buyers still in the same location.

14/ "A Stock-Trading Test Could Presage Future of Securities Industry," Wall Street Journal, October 3, 1978.

15/ Ibid.

When descriptive terminology in the trading language made possible selling by telephone conversation, trading was emancipated from the spatial requirement. Buyer, seller, and product can now be in three different locations. Nevertheless, communication between buyer and seller is still on a one-on-one basis. A seller can talk with only one buyer at a time. Conversation with alternative buyers must be done in sequence. Trading is still bound by the time dimension. Time limits the number of buyer-seller, one-on-one conversations that are practical in order to get the best price.

Electronic selling emancipates trading from this time dimension. Sellers are not limited by the time restraints--the time required to talk to a number of different buyers--or the added cost of communications in seeking out more potential buyers. With computerized electronic trading a seller makes his offering to every potential buyer in the entire market simultaneously. The geographic scope of the market is only limited by the bounds of the entire trading system. Regional and national markets are indeed possible.

Movement in the direction of a national market in the securities industry was mandated by Congress. In the Securities Act amendments of 1975, Congress enunciated a policy position on electronic computerized trading. With respect to securities, it said that new data processing and communication techniques create opportunities for more efficient and effective market operations. Moreover, it is in the public interest and appropriate for the maintenance of fair and orderly markets to assure economically efficient execution of transactions, fair competition among buyers and sellers, and the availability of information on transactions. The linking of all markets through communication and data processing facilities will foster efficiency, enhance competition, increase information available to traders, and contribute to the best execution of transactions.

Recent developmental efforts in trading stocks have been a response to that comprehensive Congressional mandate.

Trading eggs electronically was a response to an organized industry concern over the loss of a competitive price basis for trading--the almost complete disappearance of negotiated transaction prices.

Electronic trading in cotton developed in Texas because of enormous problems in seeking out the best possible buyer of a commodity which varies widely in each of four classification categories--staple length, fiber thickness and maturity and grade (color and trash)--creating several hundred classification combinations needing separate valuations.

One of the first requirements of electronic trading is the possibility of sale by description. Standard product description and other terminology, understood by all participants, is an important attribute for electronic trading, if not an absolute requirement. The more widely a given language with a commonly understood trading vocabulary can be used, the greater the potential for electronic trading.

Stocks meet this requirement best. Shares of a given stock are absolutely homogeneous and perfectly fungible.

While eggs differ somewhat, some traditional problems have virtually disappeared. Freshness is no longer an important variant. And broken eggs can be counted and priced. Gradable nest-run eggs do differ in size. But classification by weight-per-dozen permits a predictable pattern of distribution, according to the several size categories into which eggs from each shipment can be cartoned and sold in retail stores.

Cotton might appear to present greater problems because of its heterogeneity and complexity. But classification systems reduce the scope of this problem to numerical ratings for each of the four grade factors. Product description in TELCOT is taken care of with four numerical scores on the line item for each transaction lot of cotton sold through the system.

Some inferences can be made from the experience in selling stocks, eggs, and cotton as to the possibilities for selling wholesale meat electronically.

The present wholesale meat trade is conducted primarily by description between buyer and seller located some distance from each other. These characteristics themselves invite the question of the feasibility of electronic trading and makes further examination worthwhile.

Steer and heifer carcasses are classified by sex, weight, quality grade, and yield grade in terms that are understandable to all participants in the trading process. Boneless beef is classified by laboratory test scores of lean content, i.e., 90 percent chemical lean, 50 percent chemical lean, etc. Wholesale cuts of pork were classified by weight and sold by description between meat packers long before Federal grading became common.

The great distance between buyers and sellers, and the sheer numbers of buyers and sellers, enlarge the potential contribution of electronic selling to the wholesale meat trade. Instant access to all participants on the opposite side of the trade could be provided by a computerized electronic system to greatly enhance the possibility of executing the best possible transaction for both buyer and seller and provide the most competitive outlet possible.

Systems of buying and selling vary widely among the examples of electronic trading discussed on previous pages. TELCOT sells on the basis of a blind bid by prospective buyers, comparable to a sealed bid, for a given lot of cotton. Each lot is identified by warehouse, bale count, and the four classification scores, all shown as one line item on the display tube. The highest bidder during a 15-minute bidding session gets the cotton unless it is a "no sale."

In the TELCOT bidding session, the computer handles the transaction. It selects the highest bid. But TELCOT also gives farmers the option of making a firm offer. In the firm offer system, the "actors" are the market participants. The farmer sets his selling price and displays it before all merchants. The first buyer to press the "buy" key that accepts the offer gets the cotton.

The Egg Clearinghouse system matches bids and offers of buyers and sellers. During the trading session, buyers and sellers adjust bids and offers until matches are made by the computer. Directional movements of eggs often reverse themselves in different seasons of the year, especially for transactions east of the Mississippi. Transportation costs between locations, therefore, must be programmed into the system to make the best match of buyers and sellers.

The Cincinnati NMS system orders by time and arrays by price the bids and offers of stock shares. Identical bid and offer prices are ordered by time. All public customer accounts have priority over floor traders acting on their own account at the same price. Here again prices are matched.

The Toronto Stock Exchange operates an electronic system for relatively inactive stocks in which two arrayed columns are shown for each stock issue. The bid column shows the number of shares desired and the bid prices. The offer column shows the number of shares offered and the asking price. In this system, the machine simply displays bid and offer prices. Bids are arrayed with highest bid on the top. Offers are arrayed with the lowest offering on top. Both bids and offers can be withdrawn or changed at any time. But as long as they are on display, they are commitments. The action takes place at the top of the two columns. The actors are the participating brokers. If a bidding broker sees a suitable offer close to his price, he presses the appropriate keys to accept the offer. In that way, a broker bidding in Montreal may buy shares of stock offered by a broker in Vancouver.

The flexibility of computers enables adaptation to a variety of requirements for different commodities and adaptation to particular trading habits and customs of market participants.

Wholesale meat trading could be conducted by a combination of optional systems. Both bids and offers for a particular meat item can be arrayed by price. They can be grouped and displayed by regions and by time frames. Either buyer or seller seeing a suitable offer or bid may wish to contact the opposite party to consummate a transaction. This type of conversation can be accommodated through the system. Identification and location of all sellers can be indicated by plant code on all offers. Most buyers wish to know the plant that is supplying the meat on which they are negotiating. Final arrangements would cover time of shipping and credit arrangements. By the time transactions are completed, both buyer and seller know each other's identity. Some testing and experience would be needed to determine the trading rules that work best with the habits and customs of the meat trade. Needed modifications could be programmed into the system as it becomes operational.

Operating costs and selling charges will depend to a large extent on the volume that is traded. Major fixed or overhead cost elements are the costs of software involved in programming the computer to service the requirements of the trade and of the central computer. Line costs are additional ongoing costs.

Transaction costs for TELCOT and the Egg Clearinghouse have been about one-cent per dollar of sales value. Stocks are traded on computers and on conventional exchanges for a broker's commission of one-cent per share. If a share is worth $50, the charge would be $0.0002, one-fiftieth of a cent, for each dollar of cash value traded.

Prevailing charges for conventional brokerage services in today's wholesale meat trade are 20 cents for 100 pounds of meat. For a 40,000-pound truckload priced at $100 per 100 pounds, this fee would be $80 per truckload, $0.002 per pound, or about one-fifth of a cent per dollar of sales value. The 1972 census data suggests that brokers were handling a little over 6 percent of sales by packers.

TELCOT and ECI experience provides some guidance as to relative costs that might be expected for trading meat at wholesale. Egg Clearinghouse in 1977 handled a small volume, only 1,050 transactions, an average of about 20 transactions per week. Although it is a relatively simple system, the small volume of trading keeps transaction costs high. TELCOT, on the other hand, handled about 37,500 transactions during the past year. Transactions average about 10,000 pounds, less than a truckload lot. Average value was about $5,000 per lot. The 15-minute trading session for sealed bids on a single lot, however, is a more complicated system than would be required for the meat trade.

If only one-fourth of the estimated 600,000 plus truckloads of fresh meat were sold electronically on a bid and offer system, costs should be substantially lower than those prevailing for either TELCOT or ECI. The larger potential volume of transactions within the meat trade should make transaction costs much less than those prevailing for cotton and for eggs.

Projected costs for selling meat electronically should be substantially less than the brokerage commission for meat. Basic cost elements for brokering are ongoing person-time and telephone expense. Electronic sales use substantially less manpower and telephone expense than is involved in the conventional one-on-one negotiations by brokers.

It would not be reasonable to expect costs for selling meat electronically to come down to the cost levels for trading securities. The meat trade does have fewer separate items than those on a stock exchange. But meat items in the wholesale trade are more variable and require some individual description. Stock issues only require identification.

For TELCOT the system cost element of the $2.50 per-bale charge was $1.50 per bale. With an average transaction of 20 bales, weighing 10,000 pounds, valued at $5,000, the cost would be $30 per transaction. With this constructed transaction cost for system operations, costs for representative transactions of other systems can be compared:

System	Transaction Size	Transaction Cost
ECI	1 truckload (750 egg cases)	$112
Meat Brokers	1 truckload (40,000 lbs.)	80
TELCOT	20 bales (10,000 lbs.)	30
Stocks	400 shares	4

ECI transaction costs are high because of the small volume traded. Meat brokers' costs are higher because they must depend on one-on-one telephone conversations in sequence during their trading activities. TELCOT has a relatively small average size and value per transaction because it sells the output of individual farmers.

The immensely greater potential of volume in the wholesale meat trade, both in terms of total value, number of transactions, and value per transaction, suggest eventual electronic trading transaction cost levels closer to those presently prevailing for security stocks than for cotton.

Access to an electronic selling system is best accomplished with a computer terminal equipped with a television-like display tube, an input keyboard, and a printout capability for transaction records and other price and trading information to maximize trading intelligence. Sophisticated terminals capable of handling these requirements can be leased for about $500 a month, or $6,000 a year. Such a terminal could be operated by one person. For large packers that together handle more than half of the output of the meat packing industry, this would indeed be a nominal cost for access. The terminal and one salesperson could replace a corps of salespeople with desks and telephones and the associated telephone costs that are necessary for a sequence of one-on-one negotiations for each wholesale transaction.

In 1976, 63 firms that slaughtered more than 100,000 head of cattle per year accounted for about 58 percent of commercial slaughter for beef (table 2) At an average of 600-pounds dressed weight per carcass, firms at the 100,000-head volume level would sell about 1,500 truckloads of fresh beef a year--$4 a load for terminal costs to access the electronic selling system.

In the hog slaughtering sector, 32 firms that kill more than 500,000 hogs a year account for over 76 percent of the hogs handled by slaughtering packers (table 2). At the 500,000-head level of business, firms are estimated to market about 50 million pounds of fresh or frozen pork a year, more than 1,250 truckloads. For firms of this size, access costs would be somewhat less than $5 a load.

About half of the 32 hog slaughterers that handle 500,000 hogs or more annually also handle cattle. Thus, it appears that about 80 computer terminals distributed among the largest firms could handle more than 60 percent of wholesale movement of fresh meat from slaughter plants.

For smaller plants the $6,000 leasing cost per year for computer terminals need not be a barrier to accessing the system. Smaller size computer terminals, less sophisticated, with less capacity, and with a lesser leasing charge could be integrated into the network. Also, computer networks can be accessed by codes transmitted through conventional push-button telephones. The cost of a sophisticated terminal need not be a barrier for a small firm to access the electronic selling system.

Wholesale meat as a commodity appears well suited for electronic trading. It is a high value product. It is perishable product which must be moved into commerce within a few days from the time that it is converted from the livestock that meat packers buy. Thousands of transactions take place weekly. Meat moves great distances until it reaches localities where it is consumed.

Electronic marketing appears to have much to offer. It greatly magnifies the number of buyers and sellers which can be in contact with each other. It permits a superior functioning of markets in coordinating and directing the flow of various categories of meat products, each to their highest order of use. With conventional selling, smaller firms tend to have traditional repeat customers whom they contact week after week. Such firms tend to become captive suppliers, particularly of large-volume buyers. With electronic selling they will have instant access to alternative outlets whenever their traditional buyers offer less favorable terms.

Students of marketing problems generally agree that wherever it is possible, electronic selling maximizes competition in the marketplace by enlarging the trading area, by putting sellers in contact with a maximum number of outlets for their products, and buyers in contact with the maximum number of sources for their supplies. It provides the potential for both maximum efficiency and maximum competition in negotiated transactions for an industry with a large number of transactions and a large product flow and with a high value product in wholesale trading.

For individual participating firms, computerized electronic selling can provide a number of support activities. Inquiry functions give instant access to current market intelligence at any time. Prices in different sections of the country can be observed while they are being made. Prices in different time frames can be compared. It can report the highest, lowest, last, and average prices for any item, as well as total volume. For any trader it can supply a summary or "wrap-up" of all his transactions, by item, at any time, or at the end of the day. For each day's trading it can provide a schedule of product movement out of and into inventory stocks in the coolers.

These benefits to market participants under electronic selling of meat at wholesale accrue to all major segments of the meat economy. Operational benefits stem from improved accuracy of pricing and marketing information, market coordination, and confidence in the equity of trading practices. These factors are all interrelated with the improved competition and efficiency within the marketing process. Both livestock producers and meat consumers gain from the resulting improved allocation of resource use and industry coordination under electronic exchange systems.

Whether or not electronic trading can become operational on the basis of industry acceptance alone, remains a question. Many operators in the industry would like the availability of instant market intelligence. The immediate and simultaneous accessibility, both to all buyers and to all sellers of any item, offered by an electronic system, will be appealing. But having quasi-standing orders for future dispositions and needs give meat packers and retailers a sense of security. They feel assured that under formula trading one's prices are about the same as those of competitors. These features are most comforting for business managers operating with the rapid turnover of a high value product that characterizes the wholesale meat trade.

Nevertheless, electronic selling could be an exceedingly valuable adjunct to the meat wholesale pricing system. It could provide a most efficient device for negotiating transactions. It could provide the most competitive market that is conceivable for the wholesale products that provide the cash receipts for a most important segment of American agriculture--that of livestock production.

Electronic trading of wholesale meat is feasible. The technology is here.